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CURRENT LITERATURE.

BOOK REVIEWS.

Plant Geography.

THOSE WHO are interested in plant geography are extremely anxious to see new numbers of Engler and Drude's *Vegetation der Erde* as often as possible. The first volume included the results of Willkomm's exhaustive studies in the Spanish peninsula.¹ The second volume deals with the flora of the Carpathians and is from the hands of the well-known botanist, Dr. Ferdinand Pax of Breslau.² The area covered by this monograph is much more limited than that which is included in Willkomm's work, comprising the mountain districts in the eastern part of Hungary. Pax began his studies in this region in 1882 and has continued them at short intervals up to the present time. Only a short time ago he published some of the results of his study, a short preliminary sketch dealing with the various elements which make up the Carpathian flora.³

The volume under consideration discusses the plant geography of the district in a general way only, while the author contemplates a second volume which will give a more special and detailed account of the smaller areas which make up the Carpathian region.

The introduction gives a very complete history of botanical research in the Carpathians from the sixteenth century to the present time. The historical account is subdivided into the period before Linnaeus, the Linnaean period, the period between Linnaeus and 1850, and the period from 1850 to the present. Among those who deserve especial mention are Winterl, the first professor of botany in Hungary; Kitaibel, a student of Winterl's who published a monographic work on the flora of Hungary; more recently the investigations of Borbás, Hazslinszky, Kanitz, Staub, and others, in addition to the careful work of Pax, have made this interesting region one of the best known to geographic botanists. The bibliography is unusually complete, including more than 1200 titles.

¹ See BOT. GAZ. 22: 63. July 1896.

² PAX, F.—Grundzüge der Pflanzenverbreitung in den Karpathen (Engler and Drude, Die Vegetation der Erde, II). I. Band. 8vo. pp. 269, *figs.* 9, *heliogravures* 3, map 1. Leipzig: W. Engelmann. 1898.

³ PAX, F.—Ueber die Gliederung der Karpathen-flora. Jahresb. Schles. Gesellsch. Vaterl. Kultur. Breslau. 1896.

The physical geography of the Carpathians is the title of the first part of the work, under which head are discussed the geographic features of the area, especially as they are related to the physiognomy of the vegetation. A short treatment of the climatic conditions closes this part of the work.

Part two, the plant formations of the Carpathians, forms the body of the work. The formations are subdivided into three series, those of the lower hills, those of the higher mountains up to the tree line, and those above the tree line. The first two series are subdivided into formations with and without trees. The treeless portions of the lower hills are especially characterized by pastures rich in the beauty of their flowers; these pastures pass lower down into meadows where greener tints predominate. Some pastures (Puszta-weide) are more xerophytic and have a lower more open vegetation. The other treeless formations are those of the rocks and hydrophytic areas. The conifers have a very subordinate display on the lower hills, the dominant forest landscape being made up of mixed deciduous woods, in which the oaks are the most characteristic trees. With the oaks are birches, elms, hornbeams and maples. Besides these forests, there are sometimes pure growths of the beech, and mixed woods along streams, made up of the ash, alder and oak. There are also marginal thickets and xerophilous juniper formations in the hill region. In the mountain region below the tree line there are mountain meadows which pass into swamps in the lower places. The open rock formations assume a more prominent place than lower down and the species present depend upon the chemical nature of the rocks, whether calcareous or not. The mountain forests are largely dominated by the beech in the lower stretches, while higher up the spruce becomes the characteristic tree and ascends to the tree line. There are also mountain woods (Buschwald) where the beech predominates but no longer as a tall tree. Above the tree line appear the subalpine formations, in which there are extensive areas covered by dwarf shrubs, especially the dwarf pines, junipers and alders, and the rhododendrons. There are characteristic mats, meadows, and rock floras in the alpine regions still higher up. At the close of the second part Pax considers the influence of man on the vegetation, especially as it finds expression in the ruderal and culture floras and in injury to the floras.

The third part is entitled "Die Vegetationslinien der Karpathen und ihre Gliederung in Bezirke." These mountains form the east or northeast limits of many European mountain plants and also the south or southeast limits of some eastern and northern plants. The reasons for this are both topographic and climatic, and there results a notable mingling of divergent floral types. Pax finds that the vast majority of the vegetation lines are closely associated with the Kaschau-Eperjeser fault line, which follows in general the trend of the mountains; in fact the close relationship between the vegetation and the geological features is constantly emphasized. After a brief treatment of the

species common to the whole Carpathian district, the author goes more in detail into the subject of endemism. A great majority of the endemic forms are isolated, well-marked types and for the most part related to Alpine or Balkan plants. Most of the endemic plants are found east of the fault line, though those of northern origin occur throughout the district. The fault line makes a natural geographic division of the region into the east and west Carpathians and the author makes still further subdivisions of a geographic nature.

In the last part is to be found a discussion of the relations between the Carpathian floras and those of neighboring districts. The closest relationship is to the flora of central Europe, a relationship which is most strikingly shown in the forest trees. The relationship to the flora of Russia and Siberia is quite evident, though of less physiognomic value. A number of other floral elements are represented in the Carpathian flora but to a much less degree. Pax next considers the distribution of the endemic plants, and finds almost complete harmony between the two. The volume closes with a presentation of the historical development of the Carpathian flora from the Tertiary to the present, the discussion of the influence of the ice age on the vegetation having special interest and also the conclusion with regard to the paths along which migrations have occurred.—HENRY C. COWLES.

Flower ecology.

AFTER INDUSTRIOUS work on the pollination and insect relations of the floras of the North Frisian islands, Hallig islands, Helgoland, Rügen, Schleswig-Holstein, Mecklenburg, Pomerania, Westphalia, Nassau, Thüringia, Switzerland and Capri, and the investigation of many special cases, the distinguished anthoecologist of Kiel has undertaken a general review of the fundamental propositions of the subject, the literature and the results of investigations made in all parts of the world.

The first volume gives a historical account of the development of flower ecology, beginning with Kölreuter and Sprengel and including references to all of the investigators who have contributed to the subject. This is followed by an account of the status of the modern flower-theory and a review of the various modes of pollination and correlated phenomena: (1) Modes of pollination and separation of forms of flowers; (2) Autogamy; (3) Geitonogamy; (4) Xenogamy; (5) Heterostyly; (6) Cleistogamy; (7) Parthenogenesis; (8) Flower classes; (9) Flower visiting insects; (10) Methods of investigation. The extent to which these topics are elaborated may be indicated by the note that 262 pages (including index) are devoted to them.⁴

⁴ KNUTh, PAUL: Handbuch der Blütenbiologie unter Zugrundelegung von Hermann Müller's Werk "Die Befruchtung der Blumen durch Insekten." Vol. I. pp. 400. Vol. II, part I. pp. 697. Leipzig: Wilhelm Engelmann. 1898.